

# PATENT COOPERATION TREATY

## PCT

### INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY (Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference <b>BP108517/AS</b>	<b>FOR FURTHER ACTION</b> See Form PCT/IPEA/416	
International application No. <b>PCT/FI2004/050041</b>	International filing date (day/month/year) <b>19.04.2004</b>	Priority date (day/month/year) <b>17.04.2003</b>
International Patent Classification (IPC) or national classification and IPC <b>F01N 3/022, F01N 3/28</b>		
Applicant <b>Ecocat Oy et al</b>		

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 5 sheets, including this cover sheet.
3. This report is also accompanied by ANNEXES, comprising:
  - a. ☒ (sent to the applicant and to the International Bureau) a total of 3 sheets, as follows:
 

☒ sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).  
☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.
  - b. ☐ (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) \_\_\_\_\_, containing a sequence listing and/or tables related thereto, in electronic form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

4. This report contains indications relating to the following items:
- |                                     |              |   |
|-------------------------------------|--------------|---|
| <input checked="" type="checkbox"/> | Box No. I    | Basis of the report   |
| <input type="checkbox"/>            | Box No. II   | Priority  |
| <input type="checkbox"/>            | Box No. III  | Non-establishment of opinion with regard to novelty, inventive step and industrial applicability  |
| <input type="checkbox"/>            | Box No. IV   | Lack of unity of invention  |
| <input checked="" type="checkbox"/> | Box No. V    | Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement |
| <input type="checkbox"/>            | Box No. VI   | Certain documents cited   |
| <input type="checkbox"/>            | Box No. VII  | Certain defects in the international application  |
| <input type="checkbox"/>            | Box No. VIII | Certain observations on the international application   |

Date of submission of the demand  <b>15.02.2005</b>	Date of completion of this report  <b>26.07.2005</b>
Name and mailing address of the IPEA/SE Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Facsimile No. +46 8 667 72 88	Authorized officer  <b>Lars Wallentin/Els</b> Telephone No. +46 8 782 25 00

## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/FI2004/050041

Box No. I Basis of the report

1. With regard to the language, this report is based on:

- ☐ the international application in the language in which it was filed
- ☐ a translation of the international application into \_\_\_\_\_,  
which is the language of a translation furnished for the purposes of:
- ☐ international search (Rules 12.3(a) and 23.1(b))
- ☐ publication of the international application (Rule 12.4(a))
- ☐ international preliminary examination (Rules 55.2(a) and/or 55.3(a))

2. With regard to the elements of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

- ☐ the international application as originally filed/furnished
- ☒ the description:
- pages 1-12 \_\_\_\_\_ as originally filed/furnished
- pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_
- pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_
- ☒ the claims:
- pages \_\_\_\_\_ as originally filed/furnished
- pages\* \_\_\_\_\_ as amended (together with any statement) under Article 19
- pages\* 13-15 received by this Authority on 30.06.2005
- pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_
- ☒ the drawings:
- pages 1-7 \_\_\_\_\_ as originally filed/furnished
- pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_
- pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_
- ☐ a sequence listing and/or any related table(s) – see Supplemental Box Relating to Sequence Listing.

3. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages \_\_\_\_\_
- ☐ the claims, Nos. \_\_\_\_\_
- ☐ the drawings, sheets/figs \_\_\_\_\_
- ☐ the sequence listing (*specify*): \_\_\_\_\_
- ☐ any table(s) related to the sequence listing (*specify*): \_\_\_\_\_

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

- ☐ the description, pages \_\_\_\_\_
- ☐ the claims, Nos. \_\_\_\_\_
- ☐ the drawings, sheets/figs \_\_\_\_\_
- ☐ the sequence listing (*specify*): \_\_\_\_\_
- ☐ any table(s) related to the sequence listing (*specify*): \_\_\_\_\_

\* If item 4 applies, some or all of those sheets may be marked "superseded."

**Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement****1. Statement**

Novelty (N)	Claims	<u>1-25</u>	YES
	Claims		NO
Inventive step (IS)	Claims		YES
	Claims	<u>1-25</u>	NO
Industrial applicability (IA)	Claims	<u>1-25</u>	YES
	Claims		NO

**2. Citations and explanations (Rule 70.7)**

The invention relates to a porous sheet for treating exhaust gases in open channels. At least part of the porous sheet has a covering support with pores over 10 nm and particles over 1,4  $\mu\text{m}$ . With open channels instead of closed channels the clogging is minimal.

The most relevant documents cited in the Search Report are:

D1: US4293447A1

D2: US2002/0141912A1

Document D1 is considered to disclose the most relevant prior art. This document relates to a plate-shaped catalyst comprising a metal net, a finely divided porous carrier retained on the metal net with a binder and covering the metal net, and an active component supported on the carrier (see the abstract). The net may have openings about 10- to about 100 mesh. The porous carrier can be alumina, silica and zeolite (see column 2, line 51). In example 1 titania powder up to 44 $\mu$  in particle size is used on an 18 mesh metal net. A suggested corrugated catalyst with open channels is demonstrated in figure 3 and example 2.

It is considered to be obvious that the porous carrier in D1 has a median pore size over 10 nm.

The invention according to claim 1 differs from D1 in that it is explicitly stated that the area mass of support is from 20 to 200 g/m<sup>2</sup> and the BET specific surface area of support from 30 to 300 m<sup>2</sup>/g.

.../...

## Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of: BOX V

The effects of these differences are not demonstrated in the description.

Therefore, the problem underlying the present invention can be seen as simply providing a support with a specific area mass of support and BET surface area.

Since in the absence of any surprising/advantageous effect of technical prejudice there is nothing inventive in the choice of area mass of support and surface area. Further, an argumentation about the differences between the invention according to the new claim 1 and the problems these differences solve is not disclosed in the answer to the written opinion.

The invention also lacks an inventive step in view of D2. This document discloses a catalyst supported on a porous mesh-like structure with open channels (see abstract and figure 2). The mesh-like material is comprised of fibres or wires (see paragraph 0042). A catalyst is supported on a particulate support that is supported on the mesh-like material. The average particle size of the particulate on which catalyst may be supported does not exceed 200 microns (see paragraph 0048). The mesh-like catalyst support is provided with corrugations to provide turbulence to create a desired pressure differential across the material to promote the flow of the fluid into the mesh pores and to the opposite side of the material (see paragraph 0049). The mesh-material that is coated has a pore size of no greater than about 50 microns (see paragraph 0074). Vertical orientation of the packing relative to the flow direction is desired to optimize the pressure drop (see paragraph 0090). See also the examples where platinum impregnated alumina is coated on a MEC structure. Catalysts of this kind can be used for the removal of combustion products of stationary diesel and gasoline engines (see paragraph 0004).

In claims 2-12 slight constructional changes in the sheet of claim 1 is defined which comes within the scope of the customary practice followed by persons skilled in the art, especially as the advantages thus achieved can readily be foreseen. Consequently, the subject-matter of claims 2-13 lacks an inventive step.

.../...

**Supplemental Box.**

In case the space in any of the preceding boxes is not sufficient.

Continuation of: BOX V

Further, the metal substrate and the method according to claims 13-25 lack an inventive step. No actual difference between the sheet according to claim 1 and the substrate/method is present. Therefore the same statement about inventive step is valid also for these claims.

JCO9 Rec'd PCT/PTO 13 OCT 2009

Claims

1. A porous sheet for treating exhaust gases of combustion engines in open channels, **characterized** in that at least part of the porous sheet (3, 3a, 3b) has a covering support (33) having the median pore size over 10 nm and coarse particles over 1,4  $\mu\text{m}$  and the area mass of support (33) is from 20 to 200 g/  $\text{m}^2$  and the BET specific surface area of support (33) is from 30 to 300  $\text{m}^2/\text{g}$ .
2. A porous sheet(s) according to claim 1, **characterized** in that essentially all openings (32) of the porous sheet (3, 3a, 3b) have a filling support (33) having pores (35) over 10 nm and coarse particles over 1,4  $\mu\text{m}$ .
3. A porous sheet(s) according to claim 1 or 2, **characterized** in that said porous sheet (3, 3a, 3b) is a mesh sheet.
4. A porous sheet according to claim, 3 **characterized** in that the mesh size of said mesh sheet (3) is from 30 to 300.
5. A porous sheet according to any preceding claim, **characterized** in that said porous sheet is a corrugated sheet (3b).
6. A porous sheet according to any preceding claim, **characterized** in that the median particle size of support (33) is from 1,5 to 3,5  $\mu\text{m}$ .
7. A porous sheet according to any preceding claim, **characterized** in that the median pore size of said support (33) is over 5 nm.
8. A porous sheet according to any preceding claim, **characterized** in that said support (33) comprises catalytically active material.
9. A porous sheet according to any preceding claim, **characterized** in that said support (33) comprises catalytically inert particles having median particle size from 10 to 200  $\mu\text{m}$ .
10. A porous sheet according to any preceding claim, **characterized** in that said support (33) comprises catalytically inert coarse alumina-, silica, zirconia-, ceria- or/and titania-particles.
11. A porous sheet according to any preceding claim, **characterized** in that at least part of support (33) has been milled.

12. A porous sheet according to any preceding claim, **characterized** in that said support (33) comprises fibres, which are projecting out from the plane of said support.
- 5 13. A metal substrate having open channels for treating exhaust gases of combustion engines, **characterized** in that said substrate (1) comprises at least one porous sheet according to claim 1 to 12.
14. A metal substrate according to claim 13, **characterized** in that said substrate (1) comprises at least one other sheet (2a, 2b, 5).
- 10 15. A metal substrate according to claim 14, **characterized** in that said other sheet (2a, 2b, 5) is smooth, perforated, mesh, wire mesh or fibrous sheet.
16. A metal substrate according to claim 13 to 15, **characterized** in that said other sheet is a flat (2b) or corrugated sheet (2a, 5).
- 15 17. A metal substrate according to claim 13 to 16, **characterized** in that other sheet(s) (2a, 2b, 5) has been essentially covered with the support (33) of porous sheet(s) (3, 3a, 3b) according to claim(s) 1 to 15.
18. A metal substrate according to claim 13 to 17, **characterized** in that other sheet(s) (2a, 2b, 5) and porous sheet(s) (3, 3a, 3b) have been covered with same support (33).
- 20 19. A metal substrate according to any claim 13 to 18, **characterized** in that porous sheet(s) (3, 3a, 3b) and/or other sheet(s) (2a, 2b, 5) comprises impressions and/or projections.
20. A metal substrate according to any claim 13 to 19, **characterized** in that said substrate (1) is a pre-oxycatalyst, hydrolysis catalyst and/or a SCR oxycatalyst.
- 25 21. A method for manufacturing a porous sheet for treating exhaust gases of combustion engines in open channels, **characterized** in that the porous sheet (3, 3a, 3b) is at least partially covered with a support (33) having the median pore size over 10 nm and coarse particles over 1,4  $\mu\text{m}$  and having the area mass of support (33) from 20 to 200  $\text{g}/\text{m}^2$  and the BET specific surface area of support (33) from 30 to 300  $\text{m}^2/\text{g}$ .
- 30 22. A method for manufacturing a porous sheet according to claim 21, **characterized** in that the essentially all openings (32) of porous sheet(s) (3, 3a,



3b) are filled with support (33) having the median pore size over 10 nm and coarse particles over 1,4  $\mu$ .

23. A method for manufacturing a metal substrate for treating exhaust gases of combustion engines, **characterized** in that at least one porous sheet according to claim 1 to 13 is joined to said substrate (1) so that there are open channels (4) in said substrate.

24. A porous sheet(s) according to claims 1 to 13 or manufactured according to a method of any claim of 21 to 22, **characterized** in that said porous sheet(s) (3, 3a, 3b) is used to purify impurity particles (34) from exhaust gases of combustion engines.

25. A metal substrate according to claims 14 to 20 or manufactured according to a method of any claim of 23 to 24, **characterized** in that said substrate (1) is used to purify impurity particles of exhaust gases of combustion engines.